REMARKS

Applicant wishes to thank the Examiner for considering the present application. In the Office Action dated September 11, 2002, claims 1-31 are pending in the application. New Claims 32-34, supported by the original specification, have been herein added. Claims 22 and 24 are subject to a restriction requirement. Applicant respectfully requests the Examiner for reconsideration.

In response to a telephone conversation, the undersigned attorney provisionally elected, with traverse, Group I consisting of claims 1-21, 23, and 25-31. Applicant respectfully submits that claims 22 and 24 should be considered at the same time as the Group I claims. The Examiner states that handing over operation from a first satellite to a second satellite is classified in a different subclass. In claims 22 and 24, however, the handing over operation is recited in conjunction with varying the beam width during the operation within the active arc of the orbit to maintain fixed sized cells. Since the variable beam widths to obtain a substantially uniform cell size aspect is also recited, for example, in Claims 1 and 12 (as will be further discussed below), it is respectfully submitted that searching claims 22 and 24 along with Group I claims will not place an additional burden on the examining corps. Therefore, applicant respectfully requests the Examiner for a reconsideration of the restriction requirement and affirms the earlier election of Group I claims.

Claim 26 stands rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention. Applicant has amended claim 26 to depend from claim 25 as suggested by the Examiner.

Claims 1, 3, 7, and 9-10 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Castiel et al* (5,788,187) in view of *Barmat* (4,689,625), and in further view of *Bradley* (5,805,067). Applicant respectfully traverses.

Claim 1 is directed to a communication system that has a plurality of regional ground stations and a plurality of satellites located in an elliptical sub-geostationary orbit with respect to the earth. The satellites operate in a synchronized manner to provide continuous coverage to the service area. The satellites generate a plurality of beams with variable beam widths to obtain a substantially uniform cell size covering the service area. A plurality of user terminals within the service area receive communication signals from the satellite. In the present invention, the satellites are in an elliptical sub-geostationary orbit with respect to the earth. Unlike a satellite in geostationary orbit, the relative position of a satellite in an elliptical sub-geostationary orbit with respect to the earth changes as the satellite position changes. The present invention includes variable beam widths to obtain a substantially uniform cell size covering the service area. Thus, during operation, as the position of the satellite changes in the orbit, cells with substantially uniform cell size are generated by varying the beam width of beams generated during operation in the active arc of an orbit.

The *Castiel* reference illustrates an elliptical orbit satellite system. As the Examiner states, *Castiel* is silent to disclosing a plurality of beams with variable beam width to obtain uniform cell sizes. The Examiner cites the *Barmat* reference for teaching variable beam widths. The *Barmat* reference describes a satellite in geostationary orbit. In providing service to an area, it is more desirable to provide fixed cell sizes. This is commonly done for a satellite in geostationary orbit (such as *Barmat*) with fixed beam widths, since, in geostationary orbit, the relative position of the satellite with respect to the earth is fixed. The *Barmat* reference teaches phased array and mentions "beams having a varying beam width, contour, direction and surface illumination patterns." In the *Barmat* reference, however, "varying beam widths," appears to compare the beam width of one beam with another, for example, the broad beams versus narrow beams. The broad beams are polarized in one direction and the interspersed narrow beams are polarized in another direction for frequency re-use. This is substantially different from

varying a size of a beam from a satellite in elliptical sub-geostationary orbit to obtain a substantially uniform cell size . *Barmat* does not teach or suggest variable beam widths to obtain a substantially uniform cell size covering the service area.

The *Bradley* reference is set forth as disclosing a plurality of user terminals in a service area. Although user terminals and highly elliptic orbits are illustrated in the *Bradley* reference, no teaching or suggestion is found in the *Bradley* reference for variable beam widths to maintain a substantially uniform cell size. Dependent claims 3, 7, 9 and 10 are further limitations on claim 1. Therefore, these claims should also be allowable for generally the same reasons set forth above with respect to Claim 1 and further due to the additional limitations recited therein.

Claim 2 stands rejected for the same reasons set forth in claim 1 in further view of *Byrne* (5,990,883). Claim 4 stands rejected for the same reasons set forth in claim 1 in further view of *Sarraf* (6,175,719). Claims 5 stands rejected for the same reasons set forth in claim 1 in further view of *Horstein* (5,867,783). Claim 6 stands rejected for the same reasons set forth above in further view of *Diekelman et al* (6,007,027). Claim 8 stands rejected for the same reasons set forth in claim 1 in further view of *Schloemer* (RE37140). Claim 11 stands rejected for the same reasons set forth above in further view of *Castiel* (6,263,188).

Applicant respectfully submits that the combination of *Castiel, Barmat* and *Bradley* as described above has several shortcomings, including the lack of a teaching or suggestion for variable beam widths to maintain a substantially uniform cell size during operation of the satellite. None of the additional references set forth against the dependent claims include such features, and therefore these references do not cure the deficiencies in teachings of *Castiel, Barmat* and *Bradley*. Therefore, applicant respectfully requests the Examiner for reconsideration of the rejection of these claims.

Claims 12-13, 17, and 19-20 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Horkin* (5,619,211). Applicant respectfully

traverses. The *Horkin* reference teaches a locating and communication system using multiple satellite constellations. Figures 1-3 illustrate various satellites that can be used in such a system. The satellites lie in various orbits including inclined geosynchronous orbits. The *Horkin* reference, as the Examiner states, is silent as to the existence of varying the size of the beam widths to obtain a substantially uniform cell size covering the service area. The Examiner cites the *Barmat* reference for this teaching. However, the *Barmat* reference as described above is set forth with respect to a geostationary satellite and does not vary the size of the individual beam widths to achieve a substantially uniform cell size although different size beams are generated. As explained above, *Barmat's* "varying beam widths" is substantially different from the present application. Consequently, even if the references are combined, the present invention is neither suggested nor shown.

Claims 13, 17, and 19-20 are also believed to be allowable for the same reasons set forth above since they are dependent from independent claim 12. Claim 14 stands rejected for the same reasons set forth above with respect to claim 13 in further view of *Sarraf*. Claim 15 stands rejected for the same reasons set forth above with respect to claim 13 in further view of *Horstein*. Claim 16 stands rejected for the same reasons set forth above with respect to claim 13 in further view of *Cellier* (6,327,523). Claim 18 stands rejected for the same reasons set forth above with respect to claim 13 in further view of *Schloemer*. Claim 21 stands rejected for the same reasons set forth above with respect to claim 13 in further view of *Castiel*. Claim 23 stands rejected for the same reasons set forth above with respect to claim 13 in further view of *Cellier*. Each of the additional references fails to teach or suggest varying the beam widths to maintain a substantially uniform cell size. Therefore, applicant respectfully requests the Examiner for reconsideration.

Claims 25-27 stand rejected under 35 U.S.C. §103(a) as being unpatentable over *Dreischer* (6,219,617) in view of *Diekelman*. Applicant has amended claim 25 to include limitations similar to that of claims 1 and 12 which describe that the first constellation generates a uniform cell beam by

using a variable beam width wherein the beam width is formed as a function of orbit position to maintain the uniform cell size over the coverage area. These features are not taught or suggested in either the *Dreischer* reference or the *Diekelman* reference. Applicant therefore requests the Examiner to reconsider the rejection of claims 25-27.

Claims 28-29 and 31 stand rejected under 35 U.S.C §103(a) as being unpatentable over *Dreischer* in view of *Diekelman* in further view of *Caille*. Both claims 28-29 and 31 depend from independent claim 25 which has been amended to include similar limitations to claim 1 and 12. Applicant respectfully believes that these claims are allowable for the same reasons set forth above.

Claim 30 stands rejected for the same reasons set forth against claim 25 in further view of *Cellier*. Claim 30 is also dependent from claim 25, which has now been amended. Applicant respectfully requests the Examiner for reconsideration of this rejection.

In light of the remarks above, applicants submit that all rejections are now overcome. The application is now in condition for allowance and expeditious notice thereof is earnestly solicited. Should the Examiner have any questions or comments which would place the application in better condition for allowance, he is respectfully requested to call the undersigned attorney.

Respectfully submitted,

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VERSION WITH MARKINGS TO SHOW CHANGES MADE

IN THE SPECIFICATION:

Please delete the last full paragraph on page 4, lines 16-26 and continuing on page 5, lines 1-5, and substitute therefor the following replacement paragraph:

--In a further aspect of the invention, a method of providing a system of inclined eccentric sub-geosynchronous satellite orbits includes the steps of:

defining at least one geographic service area within which satellite coverage is to be provided, said service area having a minimum elevation angle thereabove;

defining at least two satellite orbits above the minimum service area having a first satellite and a second **satellite** respectively therein;

operating said first satellite to generate a plurality of fixed cells relative to the earth by varying the **[beamwidth]** **beam width** and steering the **[boardside]**__boresight__ of the beams generated during operation in an active arc of an orbit;

handing over operation from the first satellite to the second satellite to maintain at least the minimum elevation angle; and

operating said second satellite to generate the plurality of fixed cells by varying the **[beamwidth]**__beam width__ and steering the **[boardside]** __boresight__ of the beams generated during operation in the active arc of an orbit.

Please delete the first full paragraph on page 8 and substitute therefor the following replacement paragraph:

--The present invention is illustrated herein in terms of a satellite orbit system using various inclination angles, eccentricity values and other values. It should be understood that specific numerical values are introduced

as examples and not as final design values. Also, the preferred embodiment includes one satellite per orbit. However, more **[then]**__than__ one satellite could be employed.--

Please delete the first and second full paragraphs on page 18 and substitute therefor the following replacement paragraph:

--Another advantage of the present invention is that the terminals **[keep tracking to]**__track__ satellites in a semi-geostationary manner __using__ scanning angles **[with]**__of__ less than 20° **[are used]**.

As shown, the landmasses of the earth may be separated as three zones [1] North and South America, [2] Europe, Africa, Mid-East and India, and [3] China, East Asia, Australia, and New Zealand. Each zone would have only a dedicated active satellite at each moment. For business, which involves geographically closer communication, this arrangement would be a great benefit since a satellite can see the whole landmass in each zone and no inter-satellite link is necessary. For business which involves transoceanic communication (US-Asia, US-Europe, and Europe-Asia), the inter-continent traffic may be carried either through partnering with the undersea cable or the long-haul fiber companies. An optical intersatellite link (ISL) may also be used. Inter-satellite-links (ISL) however, may not be considered because of a correspondingly long development time. If the constraint of short "time-to-market" period is present, **[the development cycle]** the undersea cable aspect may be more easily implemented than an ISL.

Please delete the last full paragraph on page 19, and substitute therefor the following replacement paragraph:

--As is illustrated, each cell is not only equal in size but also __is__ fixed **[irrelevant]**__relative__ to the motion of satellites. The cell size selection may vary in each system when **[balance]**__balanced__ with design tradeoffs in

EIRP, antenna complexity, and intended coverage areas. To implement such a system, a phase array based satellite antenna with 500 to 1500 elements may be used.--

IN THE CLAIMS:

1. (Amended) A communications system comprising:

a plurality of regional ground stations;

a plurality of satellites located in **[a]**__an__ elliptical sub-geostationary orbit with respect to the earth, **[located in an elliptical sub-geostationary orbit with respect to the earth,]** said satellites operating in a service area in a synchronized manner to provide continuous coverage to said service area, said satellites generating a plurality of beams with variable **[beamwidth]**__beam widths__ to obtain a substantially uniform cell size covering said service area; and

a plurality of user terminals **[with]**__within__ the service area receiving communication signals from the satellite.

24. (Amended) A method as recited in claim **[24]**__22__ wherein said step of defining at least two satellite orbits comprises defining at least four **[obits]**__orbits__.

25. (Amended) A method of developing __a__ customized satellite constellation comprising the steps of:

developing a first satellite constellation having a first set of satellites having regional coverage having a first service area__, wherein said first constellation comprises a first plurality of satellites located in an elliptical sub-geostationary orbit with respect to the earth, said satellites operating in a service area in a synchronized manner to provide continuous coverage to said service area, said satellites generating a plurality of beams with variable beam widths formed as a function of orbit__

position to obtain a substantially uniform cell size covering said service area;

launching a second set of satellites to form a second satellite constellation having primary market coverage in cooperation with said first set of satellites to have a second service area greater than said first service area.

26. (Amended) A method as recited in claim **[26]25** comprising launching a third set of satellites to form a third satellite constellation having optimized landmass coverage in cooperation with said first set of satellites and said second set of satellites having a third service area greater than said second service area.

Please add the following new claims:

32. (New) A communications system comprising:

a plurality of regional ground stations;

a plurality of satellites located in a elliptical sub-geostationary orbit with respect to the earth, said satellites operating in a service area in a synchronized manner to provide continuous coverage to said service area, said satellites generating a plurality of beams with variable beam widths that vary as a function of orbital position to obtain a substantially uniform cell size covering said service area; and

a plurality of user terminals within the service area receiving communication signals from the satellite.

33. (New) A communication system as recited in claim 32 wherein said plurality of satellites operate using a frequency of a GSO satellite.

34. (New) A communication system as recited in claim 33 wherein said plurality of satellites do not operate in a GSO satellite avoidance zone.